

***FlyBy Math™* Alignment**
High School Mathematics Grade-Span Expectations
March 20, 2006 v.7.0

Strand: Number, and Operations

Grade-Span Expectations

M(N&O) –10–4 **Accurately solves problems involving** rational numbers within mathematics, across content strands, disciplines or contexts (with emphasis on, but not limited to, proportions, percents, ratios, and rates).

***FlyBy Math™* Activities**

--Apply mathematics to solving distance, rate, and time problems for aircraft conflict scenarios.

M(N&O)–HS–7 **Makes estimates** in a given situation (e.g., tips, discounts, tax, the value of a non-perfect square root or cube root) by identifying when estimation is appropriate, selecting the appropriate method of estimation; determining the level of accuracy needed given the situation; analyzing the effect of the estimation method on the accuracy of results; evaluating the reasonableness of solutions appropriate to GSEs across content strands.

--Predict outcomes and explain results of mathematical models and experiments.

Strand: Geometry and Measurement

Grade-Span Expectations

M(G&M)–10–7 **Uses units of measure appropriately and consistently** when solving problems across content strands; makes conversions within or across systems and makes decisions concerning an appropriate degree of accuracy in problem situations involving measurement in other GSEs.

***FlyBy Math™* Activities**

--Calculate and measure the position and time of simulated aircraft. Represent that motion using tables, graphs, equations, and experimentation.

Strand: Functions and Algebra

Grade-Span Expectations

M(F&A)- 10–1 **Identifies, extends, and generalizes a variety of patterns** (linear and nonlinear) represented by models, tables, sequences or graphs in problem solving situations.

***FlyBy Math™* Activities**

--Represent distance, speed, and time relationships for constant speed cases using tables, bar graphs, line graphs, equations, and a Cartesian coordinate system.

<p>M(F&A)–10–2 Demonstrates conceptual understanding of linear and nonlinear functions and relations (including characteristics of classes of functions) through an analysis of constant, variable, or average rates of change, intercepts, domain, range, maximum and minimum values, increasing and decreasing intervals and rates of change (e.g., the height is increasing at a decreasing rate); describes how change in the value of one variable relates to change in the value of a second variable; or works between and among different representations of functions and relations (e.g., graphs, tables, equations, function notation).</p>	<p>--Represent distance, speed, and time relationships for constant speed cases using linear equations and a Cartesian coordinate system.</p> <p>--Use graphs to compare airspace scenarios for both the same and different starting conditions and the same and different constant (fixed) rates.</p> <p>--Interpret the slope of a line in the context of a distance-rate-time problem.</p>
<p>M(F&A)– 10–4 Demonstrates conceptual understanding of equality by solving problems involving algebraic reasoning about equality; by translating problem situations into equations; by solving linear equations (symbolically and graphically) and expressing the solution set symbolically or graphically, or provides the meaning of the graphical interpretations of solution(s) in problem-solving situations; or by solving problems involving systems of linear equations in a context (using equations or graphs) or using models or representations.</p>	<p>--Apply mathematics to solving distance, rate, and time problems for aircraft conflict scenarios.</p> <p>--Represent distance, speed, and time relationships for constant speed cases using linear equations and a Cartesian coordinate system.</p>

Strand: Data, Statistics, and Probability

Grade-Span Expectations	<i>FlyBy Math™</i> Activities
<p>M(DSP)–10–1 Interprets a given representation(s) (e.g., box-and-whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts) to make observations, to answer questions, to analyze the data to formulate or justify conclusions, critique conclusions, make predictions, or to solve problems within mathematics or across disciplines or contexts (e.g., media, workplace, social and environmental situations).</p> <p>(IMPORTANT: <i>Analyzes data consistent with concepts and skills in M(DSP)–10–2.</i>)</p>	<p>--Use tables, bar graphs, line graphs, a Cartesian coordinate system, and equations to model aircraft conflicts and predict outcomes.</p>

<p>M(DSP)–HS–3 Organizes and displays one- and two-variable data using a variety of representations (e.g., box and whisker plots, scatter plots, bar graphs, line graphs, circle graphs, histograms, frequency charts, linear, quadratic, and exponential regression functions) to analyze the data to formulate or justify conclusions, make predictions, or to solve problems with or without using technology.</p>	<p>--Represent distance, rate, and time data using tables, line plots, bar graphs, and line graphs.</p> <p>--Use tables, bar graphs, line graphs, equations, and a Cartesian coordinate system to draw conclusions.</p>
<p>M(DSP)–10–3 Identifies or describes representations or elements of representations that best display a given set of data or situation, consistent with the representations required in M(DSP)–10–1.</p>	<p>--Choose among tables, bar graphs, line graphs, a Cartesian coordinate system, and equations to model aircraft conflicts and predict outcomes.</p>
<p>M(DSP)–HS–6 In response to a teacher or student generated question or hypothesis decides the most effective method (e.g., survey, observation, research, experimentation) and sampling techniques (e.g., random sample, stratified random sample) to collect the data necessary to answer the question; collects, organizes, and appropriately displays the data; analyzes the data to draw conclusions about the questions or hypotheses being tested while considering the limitations of the data that could effect interpretations; and when appropriate makes predications, asks new questions, or makes connections to real-world situations.</p> <p>(IMPORTANT: <i>Analyzes data consistent with concepts and skills in M(DSP)–10–2</i>)</p>	<p>--Conduct simulation and measurement for several aircraft conflict problems.</p> <p>--Represent distance, rate, and time data using tables, line plots, bar graphs, and line graphs.</p> <p>--Use tables, bar graphs, line graphs, a Cartesian coordinate system, and equations to model aircraft conflicts and predict outcomes.</p>

Strand: Problem Solving, Reasoning, and Proof

Grade-Span Expectations High School	<i>FlyBy Math™</i> Activities
<p>M(PRP)–HS–1 Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content and be able to:</p> <ul style="list-style-type: none"> • Expand the repertoire of problem-solving strategies and use those strategies in more sophisticated ways. • Use technology whenever appropriate to solve real-world problems (e.g., personal finance, wages, banking and credit, home improvement problems, measurement, taxes, business situations, purchasing, and transportation). • Formulate and redefine problem situations as needed to arrive at appropriate conclusions. 	<p>--Apply mathematics to solving distance, rate, and time problems for aircraft conflict scenarios.</p>

Strand: Communication, Connections, and Representations

<p>Grade-Span Expectations High School</p> <p>M(CCR)–HS–1 Students will communicate their understanding of mathematics and be able to:</p> <ul style="list-style-type: none"> • Explain and justify their thinking and develop increasingly sophisticated questions for given problem-situations. • Critique and follow the logic of arguments presented within mathematics and across disciplines. 	<p><i>FlyBy Math™</i> Activities</p> <p>--Predict outcomes and explain results of mathematical models and experiments.</p> <p>--Explain and justify solutions regarding the motion of two airplanes using the results of plotting points on a schematic of a jet route, on a vertical line graph, and on a Cartesian coordinate system.</p>
<p>Grade-Span Expectations High School</p> <p>M(CCR)–HS–2 Students will create and use representations to communicate mathematical ideas and to solve problems and be able to:</p> <ul style="list-style-type: none"> • Choose appropriate representations and mathematical language (e.g., spreadsheets, geometric models, algebraic symbols, tables, graphs, matrices) to present ideas clearly and logically for a given situation. • See a common structure in mathematical phenomena that come from very different contexts (e.g., the sum of the first n odd natural numbers, the areas of square gardens, and the distance traveled by a vehicle that starts at rest and accelerates at a constant rate can be represented by functions of the form $f(x) = ax^2$). • Find representations that model essential features of a mathematical situation (e.g., cost of postage can be modeled by a step-function). • Use representations as a primary means for expressing and understanding more abstract mathematical concepts. 	<p><i>FlyBy Math™</i> Activities</p> <p>--Choose among tables, bar graphs, line graphs, a Cartesian coordinate system, and equations to model aircraft conflicts and predict outcomes.</p>
<p>M(CCR)–HS–3 Students will recognize, explore, and develop mathematical connections and be able to:</p> <ul style="list-style-type: none"> • Explain in oral or written form how mathematics connects to other disciplines, to daily life, careers, and society (e.g., geometry in art and literature, data analysis in social studies, and exponential growth in finance). • Explain multiple approaches that lead to equivalent results when solving problems. 	<p>--Apply mathematics to predict and analyze aircraft conflicts and validate through experimentation.</p> <p>--Predict outcomes and explain results of mathematical models and experiments.</p>